

STATUS EPILEPTICUS.*

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IT should be a source of regret that a prominent writer and authority in medicine, in the description of epilepsy, in his work on practical medicine, makes this statement: "As regards the immediate danger from the paroxysms, the prognosis is always favorable;"¹ and, moreover, he makes but bare mention of the condition status epilepticus, when in reality it is the most serious phase epilepsy assumes. It is for the very reason that but comparatively little consideration has been given to this condition by the profession, excepting the medical men connected with institutions for the insane, that it has been chosen the subject of a paper, with the hope that, without being obtrusive, a somewhat systematic description and a few suggestions in regard to the treatment of such cases may be given, which may be of some interest and value.

The alarming mortality among epileptics, shown by the reports of our asylums and hospitals for the insane, and due in a great measure to status epilepticus, makes constant demands for new suggestions and ideas in the treatment of these cases; and when, moreover, it is taken into consideration that every individual, whether in an insane asylum or not, who has fallen prey to the as yet unexplained disease, idiopathic epilepsy, either in a mild or severe form, may at any time be attacked with this almost surely fatal phase of the disease, it would seem that any point, either in clinical history, pathology or treatment must be of interest to the profession, and certainly to the neurologist and alienist.

This paper has been prepared in the hope that it may possibly advance some new ideas, and at least be a reminder of this extremely serious phase of epilepsy.

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¹ Flint: Principles and Practice of Medicine.

As to the cause or causes productive of idiopathic epilepsy, we must, as yet, say we do not know, and consequently the same statement must be made in regard to status epilepticus; so the treatment of these cases will of necessity be dependent upon theory and symptoms.

Whether or not epilepsy is an entity and has but one cause in its production, or is a disease resulting from a number of factors, it is well known that it varies in intensity from a form which but slightly interrupts the daily routine of life to one which utterly destroys the individual physically, mentally, morally and socially, and no matter how mildly the neurosis may exhibit itself in a special case, the individual has the taint or lesion, which at any time may be productive of violent convulsions, and in a few hours carry its victim into eternity.

It is as if one were standing near a comparatively innocent and harmless stream; but the bursting of a dam sets in motion the pent-up flood, and in an instant he is swept into oblivion.

If we accept the theory of J. Hughlings Jackson regarding the cause of epilepsy, viz., an over-discharge of nerve-force, or energy, from the brain cortex, we might define status epilepticus as a continuous, rapid and violent discharge of this nerve-force, followed by a condition of extreme stupor verging upon coma, or, in place of the stupor, a period of maniacal excitement, though this latter is extremely rare.

Status epilepticus can scarcely be considered a special form of epilepsy, nor is it at all correct to make it a distinct disease, but, on the contrary, it should be regarded as a climax of epilepsy.

A condition resembling status epilepticus may result in epileptics in whom the disease is caused by gross lesions, as tumors, cysts, etc., and to a considerable extent it is analogous to the epileptiform seizures, and consequent condition of parietic dementia; but it is not the purpose of this paper to treat of such cases.

In order to preserve as far as possible a systematic order

in the consideration of the subject, the following headings are given :

1. The clinical history.
2. Résumé of cases treated.
3. Notes of autopsies.
4. Prognosis.
5. Treatment.

The clinical history of status epilepticus, "état de mal," or "les séries," of the French, or, as Charcot calls it, "the epileptic acme," from observations made by the writers upon the cases to be cited hereafter, is as follows :

A rapid succession of convulsions, usually of "grand mal" type, with intermissions varying from a few seconds to a few minutes, and often following one another so closely that they resemble one continuous convulsion, the patient being in a stuporous or even comatose condition in the intervals.

The pulse and breathing are greatly accelerated, the former being weak and irregular ; there is deep congestion of the face and neck and intense throbbing of the carotids.

The temperature rises rapidly, until it has reached 104°-107° F., and there is often a difference in the temperature of the two sides, the greatest heat being on the side which is most convulsed.

As the convulsions increase in frequency and violence, there is a corresponding rise in the temperature and a deepening stupor or coma in the intervals. The conjunctivæ are insensitive ; the pupils are widely and (as a rule) evenly dilated, though occasionally there is a difference in size, and are not affected by light ; patient is bathed in a cold sweat, though the skin feels intensely hot ; sordes appear on the gums and teeth, and the bladder and bowels are involuntarily evacuated. This condition may last from one to several hours ; but, as a rule, the convulsive stage is of comparatively short duration, though occasionally it is prolonged.²

² One patient in the West Riding Asylum had 1,849 convulsions, covering a period of fifteen days. Delasuiave reports a case where the first stage lasted a month, the patient having 2,500 fits. A patient in the Northern Michigan Asylum had 3,000 in three weeks.

Death may occur in this stage from exhaustion, or the convulsions may cease and the patient pass into the second or stuporous stage.

This stage is characterized by an intense stupor, total abolition of sensation and motion, exceedingly depressed heart's action, and a consequent dyspnœic condition. The temperature remains above normal, though not as high as in the convulsive stage.

There is paralysis of the muscles of deglutition, very often irritability of the stomach, and sometimes profuse diarrhœa; bed-sores appear; the tongue is dry and coated; increasing sordes on the teeth and gums, and, in short, everything points to a rapid dissolution. The second stage lasts from one to several days.

Charcot³ makes two classes of status epilepticus, viz., "the minor acme ('les petites séries'), constituted by from two to six fits, and the major acme ('les grandes séries'), in which from twenty to thirty fits have been reckoned in the twenty-four hours." It would hardly seem that this division is necessary, for the very reason that it is an extremely rare occurrence for from two to six fits to produce the stuporous stage of the status proper. Evidently Charcot regards the convulsive stage as constituting status epilepticus without including the comatose stage. Hence his two classes.

Rosenthal⁴ gives the following description: "Another severe form of epilepsy is described under the name of status epilepticus. It presents the following characteristics: Rapid succession of attacks, presenting slight remissions and without return to consciousness (convulsive stage); a comatose condition secondary to these attacks, with abolition of reflex power, except during short periods of temporary increase (meningeal stage); more or less complete and permanent hemiplegia; acceleration of the pulse and respiration; and especially a marked elevation in temperature (40°-43° C.), which persists even in the intervals of the

³ Charcot: Diseases of the Nervous System.

⁴ Rosenthal: Diseases of the Nervous System.

paroxysms, and may increase after their disappearance. The duration of these attacks may vary from three to nine days; more than one-half the cases terminate in death."

Putzel⁵ gives the clinical history in the following words: "The prodromata do not differ in any respect from those which are usually experienced by the patient prior to the ordinary attack of convulsions; but the fits, instead of ceasing, follow one another rapidly, and before the epileptic coma has entirely disappeared, another convulsion makes its appearance. The intervals between the fits become shorter and shorter, until they run into one another, and finally the patient appears to be in one long-continued convulsion.

"The pulse is regular, but usually small, the respirations become frequent and labored. The temperature begins to rise from the very beginning, and may rapidly reach a height of 104°, 105° or 107° F., and upward. The skin is hot and scorching, the face is covered with an abundant, viscid sweat. Marked nystagmus is present, and the face and neck may be drawn to one side. The pupils are dilated, either equally or unequally, and do not react normally to light.

"After the convulsions have lasted some time, hemiplegia develops in a large number of cases, the face and limbs being affected as in ordinary hemiplegia. . . . The sensorial and intellectual functions are totally abolished, and the patient lies in a profound stupor, which often deepens into coma." . . .

Secondary or Meningitic Stage.—"At the close of the first stage the convulsions become more infrequent, and finally cease, but another series of symptoms develop. The intelligence is more or less affected, and the patient is in a condition of hebetude or coma." The author goes on to say that in this stage the coma may be replaced by maniacal excitement, general disturbance of nutrition, emaciation, bed-sores and a gradual dissolution or an extremely slow recovery.

⁵ Putzel: Functional Nervous Diseases.

Bevan Lewis⁶ describes it as follows: "If the attacks succeed each other rapidly and consciousness is not restored between the convulsive seizures, if fit succeed fit at intervals of a few moments only, the patient remaining comatose, we have developed what is termed the status epilepticus, a condition of most serious import.

"The pulse and breathing become quickened; . . . the temperature rises to 105° or 107° F., with deepening coma or stupor. . . . As the fatal termination approaches, the convulsions become more frequent, a few seconds only intervening between each discharge, so at times they appear almost continuous, a fresh discharge being only recognized as a slight increase in the intensity of the convulsions.

"When this period arrives, however, the epileptic discharge becomes progressively feeble, and the fit may be characterized by a slight turning of the head and eyes to one side, with slight clonic movements of the limbs or merely convulsive twitchings of the mouth, with conjugate deviation. The conjunctivæ are, of course, quite insensitive, the pupils being widely dilated and fixed to the strongest glare of light, while the face and body are bedewed with a cold sweat. Often the temperature exhibits unilateral deviations, being highest by a degree or more on the side first (or most) convulsed. If the patient recover, the fall of temperature is most rapid on this side until a balance is established, and subsequently an equal and continuous decline of temperature proceeds on both sides. . . . The mortality from status epilepticus is said to be due to (a) collapse and (b) to meningitis." . . .

Bourneville⁷ in his treatise characterizes status epilepticus: (1) by the frequent repetitions of the convulsions, which may even become almost continuous with one another; (2) by a variable degree of collapse, which may deepen into a most profound coma, unattended by any return to consciousness; (3) by a more or less complete hemiplegia, developing after a variable duration of the

⁶ Bevan Lewis: *Text-Book of Mental Diseases*.

⁷ Bourneville: *Études Cliniques et Thermométriques sur les Maladies du Système Nerveux*, 1873.

symptoms; (4) by increase in frequency of pulse and respiration; (5) by considerable elevation of temperature, which persists in the brief interval between the convulsions. He, with others, divides it into two periods—a convulsive and meningitic.

Calmeil, Trousseau, Delasuiave, Gowers, Webber and Blandford give more or less on the subject; but as their statements are covered by the authors already quoted, it is useless to give them here.

Twenty cases of status epilepticus have come under the observation of the writers; but only twelve are cited, as the remaining eight would only be repetitions of the others:

CASE I.—Male, aged 25; congenital imbecile; family history shows marked neurotic taint; had scarlet fever when fifteen years of age, and soon after recovery epilepsy appeared; has had an average of ten fits a month since development of the neurosis; physical condition much impaired. During November, 1888, had three fits; December, eleven, and January, twenty-four.

All of this time he was taking a mixed tonic and bromide treatment. On February 24th, at 2 P. M., after an interval of several days without fits, he had a severe convulsion, followed by others in rapid succession, averaging one every two minutes for the first hour. At 3 o'clock his temperature was 102° F., respiration 30, pulse 106, skin hot and covered with perspiration, pupils dilated equally and not reacting to light, face much congested; unconscious, though not having a convulsion at that time. Ether was given and carried to surgical anæsthesia, with a cessation of the convulsions. Given chloral hydrate, grs. xxx., by rectum. Slept well until 9 P. M., but on awakening he immediately went into a series of convulsions, having thirteen in twenty minutes. At 9.30 P. M., temperature was 104° F., respiration 35, pulse 130. Ether was again administered, and morphinæ sulph., gr. $\frac{1}{4}$, hypodermically. February 25th: Slept during the night. This morning he lies in a stupid condition; temperature 105.6° F., respiration 41, pulse 129, cold sweat over entire body, pupils dilated and insensible to light. Given nourishment and stimulants by stomach-tube. Remained in this condition until death, at 5 P. M. Duration of attack, fifty-seven hours; number of convulsions, forty-three.

CASE II.—Male, aged 28; congenital imbecile; had scarlet fever when ten years old, and immediately after

developed epilepsy; no known heredity. During February, March and April, 1889, he had one fit while under tonic treatment. On May 2d, between 1 and 5 A. M., he had one hundred and six convulsions. At 5 A. M., temperature was 104.5° F., respiration 32, pulse 130. The fits followed each other with very short intervals, the patient being unconscious. Chloroform was administered, and continued for a half hour; ol. tigllii, gtts. iii., followed by profuse evacuations. In this case the convulsions were general, but stronger on the right side; right hemiplegia followed the attack. Patient sank into a stupid condition, which lasted five days. During this time the temperature and pulse were constantly above normal, the gradual return to consciousness being preceded by an even fall of temperature. Sordes collected on the teeth; tongue brown and dry. The reflex action of the eyes was lost, and death seemed imminent. Stimulants and nourishment were given constantly by the nasal tube. On the fifth day he recovered consciousness; the temperature slowly fell to normal. Rapid improvement followed, and in ten days he was able to be about the ward. The total duration of the convulsive and comatose periods was about ten days; number of convulsions, one hundred and six.

CASE III.—Same patient as Case II. On October 27, 1889, was found in the morning in a comatose condition, which, without doubt, resulted from his having passed through the convulsive stage of status epilepticus during the night. Temperature 105° F.; impossible to arouse him from the deep coma; pulse weak and intermittent. Stimulants and nourishment given per nasal tube. The physical exhaustion was so great that the man sank rapidly, and died eight hours after first being seen.

CASE IV.—Male, aged 30; neurotic family; epileptic from childhood; no specific history; in good physical condition. Has had several attacks of status epilepticus, of which no record has been kept. These attacks were all marked by the large number of convulsions, their severity, the rapidity of their occurrence, and the short intervals between them. On February 21st, at 3 P. M., the convulsions began while the patient was outdoors. When first seen, he had had fifteen convulsions within a half hour and was in an extremely exhausted condition. Temperature 102° F., pulse small, body covered with cold perspiration. The convulsions were general and of uniform severity on

the two sides. Coninæ hydrobrom., gr. $\frac{1}{100}$, was given hypodermically. One convulsion followed the injection, after which the patient sank into a quiet sleep lasting six hours. On awakening, his condition seemed much improved; temperature 99.8° F., pulse 106; conina, gr. $\frac{1}{100}$, with digitalin, gr. $\frac{1}{100}$, given hypodermically. Slept during the night without convulsions. Next morning he was much better, though very weak. Stimulants and nourishment. Two days after was about the ward as well as before the attack.

CASE V.—Same patient as Case IV. On April 15th had twenty convulsions, followed by great exhaustion. Given ether to anæsthesia, chloral, grs. xxx., by rectum. At intervals for twenty-four hours he had convulsions of a more or less severe character, followed by stupor, from which he could not be aroused. Stimulants, nourishments, injections of ether, digitalin and atropiæ sulph. were given without effect. Patient gradually failed, and died ten days after. The highest temperature in this case was 105.2° F., which occurred just before death. For some weeks before each of these attacks the patient had been taking bromide treatment.⁸

CASE VI.—Male, aged 45; no known heredity; cause of epilepsy unknown; bodily in good health; weight 170 pounds; has very few epileptic convulsions, usually not more than six in a year; during the four months before the attack had three convulsions; several previous attacks of status epilepticus. This attack began on May 4, 1889, at 7 A. M., and in one hour he had thirty-two convulsions, which were continuous, the intervals between the fits being marked only by a slight diminution in the severity of the convulsions. At 8 A. M. there were no signs of exhaustion; temperature 100° F., pulse 90. Given ether to anæsthesia and morph. sulph., gr. $\frac{1}{3}$, hypodermically. No diminution in convulsions except while under ether. At 9.30, chloral, grs. xxx., by rectum, after bowels had been moved by enema. At 11 ether was given and carried to surgical anæsthesia, without effect. At 12 coninæ hydrob., gr. $\frac{1}{100}$, hypodermically; a few minutes after he had a single fit, and this was followed by sleep. This same dose was repeated at 6 and 9 P. M. Slept all night. No convulsions in the morning, no excitement. An interesting feature of

⁸ Bromide of ammonia, bromide of sodium, aa, gr. xv., suspended in a tonic mixture, t. i. d., and a pill of oxide of zinc, extract of belladonna, aa, gr. $\frac{3}{4}$, at night.

this attack is the absence of excitement, which has always before followed status epilepticus in this patient.

CASE VII.—Admitted July 8, 1889. Male, aged 38; family history of insanity and epilepsy. On January 4, 1890, was attacked with status epilepticus, though since admission has only had five convulsions; fits followed each other so closely that attendants were unable to count them. When first seen, the convulsive stage had nearly ceased. Ether was administered, and morphine hypodermically. The convulsions were stopped entirely, but the man died in the second stage from exhaustion forty-eight hours after the commencement of the attack.

CASE VIII.—Male, aged 26; no known heredity; a deaf-mute; febrile disease in early childhood is the supposed cause of epilepsy; has had an average of five epileptic fits a month while under a mixed tonic and bromide treatment; physical condition is usually good, but at present somewhat impaired from constant use of bromides. May 25th had a series of convulsions in the night, number unknown, but when first seen he was passing from one fit to another without any marked interval. Given hyoscine hydrobrom., gr. $\frac{1}{100}$, hypodermically, at 4 A. M. Slept until 7 A. M., and was then awakened by a convulsion, which was immediately followed by others; given amyl nitrite by inhalation, without effect; ether administered, and chloral, grs. xxx., per rectum, with but a temporary cessation of convulsions; 12 M., coninæ hydrobrom., grs. $\frac{1}{100}$, hypodermically, after which the fits ceased and sleep ensued. At this time his physical condition was bad; temperature 104° F., pulse 142, body covered with cold perspiration, face cyanotic, hands and feet cold. At 9 P. M. he was somewhat restless, although there had been no recurrence of the convulsions; slight muscular movements in different parts of the body. Given nourishment and whiskey per nasal tube, an enema, digitalin and coninæ hydrobrom., aa, gr. $\frac{1}{100}$, and atropiæ sulph., gr. $\frac{1}{60}$, hypodermically. Slept during the night without a convulsion, and is less stupid this morning; takes nourishment and stimulants. From this time he improved gradually, and in five days was about the ward again.

CASE IX.—Same patient as Case VIII. For past two months has had no convulsions under a mixed tonic and bromide treatment. August 20th, at 2.30 P. M., an attack began similar to the last; physical condition much better than at time of last attack. When first seen had had thirteen

convulsions; temperature 100° F., pulse 110. Given coninæ hydrobrom., gr. $\frac{1}{100}$; slept until evening without convulsions and was in good physical condition; takes nourishment this morning, and was able to be about the ward on the following day.

CASE X.—Male, aged 46; family history shows a predisposition to nervous disease; duration of epilepsy unknown; has a history of syphilis twenty years ago, but there is no indication of cerebral disease or that his convulsions are not true epilepsy. At the time of his attack he had had no convulsions for several months. On December 16, 1890, had three fits in the afternoon, followed by seven in the evening, without physical failure. At 9 P. M. given coninæ hydrobrom., gr. $\frac{1}{100}$; slept during the night without recurrence of the fits. At 8 A. M. convulsions again occurred the same in character as before. Given chloral, grs. xxx., and potass. bromide, grs. 60, by stomach, without effect; also morph. sulph., gr. $\frac{1}{3}$, and atropiæ sulph., gr. $\frac{1}{30}$, with the same negative effect; at 11 P. M., coninæ hydrobrom., gr. $\frac{1}{30}$, with an immediate cessation of the convulsions. Patient rapidly improved, and in two days was in his usual health.

CASE XI.—Male, aged 45; family and previous history unknown; has had previous attacks of status epilepticus, all having two points in common, viz., (1) the large number of fits and their rapid occurrence, and (2) a state of secondary consciousness following such attacks in which the patient was greatly excited and very brutal; violent to any one who came near him. Physical condition good; has had three fits in the last three months. On May 10th, at 4 P. M., he had a severe convulsion, followed by others with intervals of about two minutes between them. At 4.20 he was etherized, after taking chloral hyd., grs. xxx., and potass. bromide, 3 i. On coming out of the anæsthetic, no convulsions occurred until 5.30 P. M. At 6 he was given coninæ hydrobrom., gr. $\frac{1}{100}$. Slept during the night without convulsions. No attack followed this, and the man rapidly returned to his usual condition. The highest temperature during this attack was 104° F., pulse 110.

CASE XII.—Same patient as Case XI. Physical condition impaired; no convulsions for several weeks. September 30th: had twenty-three fits between 11 A. M. and 12.30 P. M. Given coninæ hydrobrom., gr. $\frac{1}{100}$. Convulsions ceased. Slept until 7 P. M., when the convulsions again commenced;

conina repeated with same good result. October 1st: had several severe convulsions, followed by unconsciousness, stertorous breathing and right-sided hemiplegia. After being in this condition for about fifteen hours, death occurred. Temperature in this case ranged between 103° on the first day of the attack and 107° at time of death.

Such are the histories of twelve attacks of status epilepticus.

Of the twenty cases which have come under our care, four were examined post-mortem.

These examinations showed certain points common to all: (1) a lack of symmetry in the two hemispheres, which is so often found in epileptics; (2) an inequality in the weight of the two hemispheres, also quite common in epileptics; (3) more or less extensive decortication; (4) intense engorgement of the brain and its membranes—the sinuses were filled with blood, the vessels of both the dura and pia were distended, the brain on section showed the puncta vasculosa to a marked degree; (5) in all four cases, and especially marked in two, serous effusion into the ventricles and arachnoid space.

In one of the cases there was softening of the first and second temporo-sphenoidal convolutions on the right side. In another, which showed all the symptoms of apoplexy toward the end of the attack, a large hemorrhage from the middle cerebral artery on the left side was found.

In a third case, in which death occurred instantly and during a convulsion, a small hemorrhage was found in the medulla.

In none of these four cases was the cause of the status epilepticus found, and in only two was there evidence of the immediate cause of death. The others, in all probability, died from the exhaustion consequent upon the convulsions.

The prognosis of status epilepticus is very unfavorable, the mortality being estimated at fifty per cent. The violence and frequency of the convulsions, the high temperature; the rapid, weak and irregular pulse; the consequent comatose condition, with its accompanying extreme de-

pression, are all factors of such grave import that the outlook in most cases is very serious. Besides this, we must take into consideration the mechanical action brought into play, viz., the intense and powerful contractions of the muscles during a convulsion, which, by exerting an irresistible pressure on the vessels, force the blood into the cerebral vessels, thus producing the great engorgement, with imminent liability to cerebral hemorrhage.

Even though the individual passes safely through the status, hemiplegia often results, leaving him in a weak and helpless condition, and totally unable to withstand a second attack.

The three most probable modes of death are: (1) exhaustion; (2) from cerebral hemorrhage; (3) from serous effusion.

Treatment.—In a condition like status epilepticus, where the life of the individual may be destroyed in a few hours, any measure which will abort the attack is of the greatest importance. Our treatment must be chiefly symptomatic, at least until more is known of the pathological condition than we know at present. There are two important indications for treatment which must be met in each case: (1) to bring the convulsive period to an end as quickly as possible, and (2) to sustain the life of the individual through the stupid or excited period which may follow the attack.

(1.) In order to meet the first indication for treatment, a large number of drugs have been tried, with a view of depressing the motor centres of the cerebrum or cord, or of paralyzing the efferent nerves, or all of these, and thus preventing a fatal termination, either by diminishing the number of convulsions, making them less severe, or preventing them altogether. Among the therapeutic measures suggested to fulfill this indication, we shall consider only those with which we have had personal experience in our own cases. These include the following: Ether, chloroform, chloral hydrate, bromide of potassium, nitrite of amyl, sulphate of morphine, sulphate of atropine, hydrobromate of hyoscyne, salicylate of physostigmine, and hydrobromate of conine.

Ether and chloroform are given with the purpose of immediately stopping the convulsions by paralysis of the motor centres of the cerebrum and complete muscular relaxation.

However successful these may be in the convulsions of Jacksonian epilepsy, in our experience in cases of idiopathic status epilepticus they are but temporary measures, the convulsions ceasing only when the point of surgical anæsthesia has been reached, and coming on again before the patient has regained consciousness. They are of great use, however, in preventing the convulsions when exhaustion is imminent, while waiting for some other agent to act. Either may be used; but in a case where the heart and respiration are already in a weakened condition, ether would be the safer.

Chloral hydrate by the rectum has succeeded in some cases, but has more often failed. In giving this drug, it has been the custom to keep the patient under an anæsthetic during its absorption, giving grs. xxx., and repeating it in an hour if necessary. Although acting as a depressant of the spinal cord and brain, yet the amounts which can be given with safety are usually too small to produce the desired effect. We have not used it hypodermically, but it seems probable that used in this manner the results would be much better.

Bromide of potassium has been given in several cases in combination with chloral hydrate, but without any good results. If, as in several of our cases, status epilepticus follows a course of bromide treatment, very little could be expected from it, and indeed, in any case, its action is so slow that but little could be hoped for from its use. In the few cases in which we have tried it, it has been given in doses of 3 i.—3 ii.

Nitrite of amyl is highly recommended by some authors; but repeated trials have failed to establish its value. It has been given by inhalation, ℥ x., repeated at intervals. Although undoubtedly useful in preventing an impending convulsion of ordinary epilepsy, it has proved of but little value in the cases of status epilepticus in this hospital.

Sulphate of morphine has succeeded in one case in which gr. $\frac{1}{2}$ was given hypodermically during ether anæsthesia; but in several other cases in which it was used it failed to change the course of the attack in any appreciable way, although given in doses of gr. $\frac{1}{4}$ - $\frac{1}{2}$, hypodermically.

Sulphate of atropine, in any safe dose, acts strongly upon the cardiac and respiratory centres and upon the pneumogastric nerve, but very slightly on the motor nerves of voluntary muscles. Carried further than this, it stimulates the cardiac sympathetic and paralyzes the pneumogastric, and in consequence there results a rapid heart failure. For this reason it is impossible to stop the convulsions without cardiac failure. Its immediate effect has been good by its stimulating action on the vagus and the resultant improvement in the character of the respiration and circulation. Although it has been used with a view to stopping the convulsions, it is of more value in the second stage of the neurosis.

Hydrobromate of hyoscine, if given in sufficient amount hypodermically, produces almost immediate sleep, affects the motor tract of the spinal cord and cerebral cortex, and in a case in which its use is not contraindicated by weakness of the heart or respiration, its employment promises good results. In the cases in which it has been used, the convulsions have quickly ceased, the heart's action has been slightly depressed after a short time, the respirations have been more frequent and less full, and sleep has followed, lasting from two to eight hours, with a recurrence of the convulsions on awaking, and an improvement has occurred in the patient's condition. Although hyoscine has failed to bring the attack to an end in any of these cases, yet the rest and freedom from convulsions for several hours, with the resulting improvement in the bodily condition, would indicate its use as a temporary measure. It has been given in doses of gr. $\frac{1}{80}$ - $\frac{1}{100}$, hypodermically, its success in acute mania when given by this method, and its almost complete failure when given by the stomach, suggesting a similar result in status epilepticus.

Salicylate of physostigmine, gr. $\frac{1}{80}$, was given in one case with a view of depressing the cord sufficiently to stop the convulsions, but without success.

Hydrobromate of conine was first used in a case in which most of the other measures in this list had failed, and its use was followed by an almost immediate cessation of the convulsions. Its action is from the periphery, extending toward the centre, the motor nerves being chiefly affected, the sensory nerves remaining almost unchanged. When a case in which it has been given is carefully watched, the following results are noticed: (1) weakening of the convulsive movements, beginning at the lower extremities, extending upward over the trunk and upper extremities, and last the head and face, with finally a complete cessation of the movements if a sufficient amount has been given; (2) slight dilation of the pupils and ptosis; (3) some impairment of general sensibility; (4) heart slow and full, respiration slow and labored; (5) combined with sulphate of morphia, sleep follows, lasting several hours; (6) if the convulsions are to return, as the influence of the drug is lost, fibrillary contractions, beginning above and passing downward—that is, in the opposite direction from what they ceased—and finally the general convulsions are reëstablished. This drug has been given in small doses, gr. $\frac{1}{100}$ – $\frac{1}{40}$, hypodermically, and repeated as often as indicated, the administration being guided by the character of the respiration. It has usually been combined with sulphate of morphine to produce sleep, and sulphate of atropine to act as a stimulant to the respiratory and circulatory organs, and also at times with digitalin and hyoscine. Only two of the cases in which it has been used have terminated unfavorably. In the first it stopped the convulsions; but they recurred, and cerebral hemorrhage complicated the case. In the second case it was given as were all the drugs mentioned, the only measures attended with any success being the administration of ether and chloroform, until there was complete muscular relaxation; and in this case the patient died suddenly, while in a fit, from hemorrhage into the medulla. In several of the cases, conine and a small amount of morphine have been

the only drugs used. Although it failed to control the convulsions in one case, yet it has been the most successful method of treatment tried, and its results encourage us to believe that it will succeed in the majority of cases of status epilepticus.

(2.) The exhaustion of the patient gives the second indication for treatment. In almost every case of status epilepticus, before the convulsions can be controlled there are evidences of physical failure; the pulse is rapid and weak, the respiration shallow and increased in rapidity, the temperature raised several degrees above normal, and a profuse perspiration covers the body, all of which call for immediate treatment in order to carry the patient through the dangerous period. The condition of the patient usually prevents the administration of food or medicine by the mouth, although if introduced into the stomach they will be retained. To fulfill this indication, we have introduced two methods: (1) the hypodermic use of such agents as atropine, digitalin, spt. frumenti and quinine sulph.; and (2) the introduction of milk, eggs and stimulants into the stomach by means of the nasal and stomach tubes, on account of the inability to swallow: artificial introduction of food into the stomach being especially called for in cases in which the stupid or excited periods are of several days' duration.

The conclusions drawn from this paper are as follows:

1. On account of its association with epilepsy, status epilepticus should not be considered a distinct disease, but merely a climax of the neurosis.
2. It consists of two stages: (1) a convulsive, and (2) a comatose, though the latter is sometimes replaced by a period of maniacal excitement.
3. That there is no demonstrable lesion causative of the status.
4. That the prognosis is unfavorable.
5. That the treatment is in a measure symptomatic, but considerable reliance can be placed upon the hypodermic use of the hydrobromates of hyoscine or conine combined with the sulphate of morphine.